WHAT IS CLAIMED IS:

1. A method of identifying nucleic acid samples comprising:

providing a mircoarray including a substrate coated with a composition including a population of micro-spheres dispersed in a fluid containing a gelling agent or a precursor to a gelling agent and immobilized at random positions on the substrate, at least one sub-population of said population micro-spheres containing an optical barcode generated from at least one colorant associated with the micro-spheres and including a nucleic acid probe sequence;

contacting said array with a target nucleic acid sequence; and

detecting the color barcode of said sub-population of micro-spheres due to the interaction of said probe nucleic acid sequence and said target nucleic acid sequence.

2. The method of claim 1 wherein said microarray population of micro-spheres includes a plurality of sub-population of micro-spheres, wherein each said sub-population of micro-spheres obtain a unique optical barcode and has a unique probe nucleic acid sequence.

3. The method of claim 1 wherein said optical barcode is generated by two or more colorants.

4. The method of claim 1 wherein said optical barcode is generated by a mixture of red (R), green (G), and blue (B) colorants.

5. The method of claim 1 wherein said at least one sub-population of micro-spheres has a luminescent property and wherein said detecting includes:

(a) whole frame imaging capture of the luminescent image resulting from said interaction of said probe nucleic acid sequence and said target nucleic acid sequence to produce a first image;

(b) whole frame imaging capture of said microarray under bright field illumination to obtain microsphere color signature/barcode image to produce a second image; and

(c) processing said first and second images to obtain identification of said nucleic acid sample.

6. The method of claim 5 wherein said processing uses a pattern recognition algorithm to obtain said identification.

7. The method of claim 1 wherein said at least one sub-population of mircospheres has a fluorescent property and wherein said detecting includes:

(a) whole frame imaging capture of the fluorescent image resulting from said interaction of said probe nucleic acid sequence and said target nucleic acid sequence to produce a first image;

(b) whole frame imaging capture of said microarray under bright field illumination to obtain microsphere color signature/barcode image to produce a second image; and

(c) processing said first and second images to obtain identification of said nucleic acid sample.

8. The method of claim 1 wherein said substrate is characterized by an absence of specific sites capable of interacting physically or chemically with the micro-spheres.

9. The method of claim 1 wherein said micro-spheres bear surface active sites which contain said nucleic acid probe.

10 The method of claim 1 wherein said micro-spheres have a mean diameter between 1 and 50 microns.

11. The method of claim 1 wherein said micro-spheres have a mean diameter between 3 and 30 microns.

12. The method of claim 1 wherein said micro-spheres have a mean diameter between 5 and 20 microns.

13. The method of claim 1 wherein said micro-spheres in the composition are immobilized on the substrate in a concentration between 100 and 1 million micro-spheres per cm^2.

14. The method of claim 1 wherein said micro-spheres in the composition are immobilized on the substrate in a concentration between 1000 and 200,000 micro-spheres per cm^2.

15. The method of claim 1 wherein said micro-spheres in the composition are immobilized on the substrate in a concentation between 10,000 and 100,000 micro-spheres per cm^2.

16. The method of claim 1 wherein said micro-spheres comprise a synthetic or natural polymeric material.

17. The method of claim 16 wherein said polymeric material is an amorphous polymer.

18. The method of claim 17 wherein said amorphous polymer is polystyrene.

19. The method of claim 1 wherein said micro-spheres contain a polymeric material and less than 30 weight percent of a crosslinking agent.

20. The method of claim 1 wherein said micro-spheres are prepared by emulsion polymerization or limited coalescence.

21. A method of identifying nucleic acid samples comprising:

providing a microarray including a substrate coated with a composition including a population of micro-spheres immobilized at random positions on the substrate, at least one sub-population of said population of micro-spheres containing an optical bar generated from at least one colorant associated with the micro-spheres, having one of a luminescent or fluorescent property and including a nucleic acid probe sequence;

contracting said array with a target nucleic acid sequence; and

detecting the color bar code of said sub-population of micro-spheres due to the interaction of said probe nucleic acid sequence and said target nucleic acid sequence by;

(a) whole frame imaging of the luminescent or fluorescent image resulting from said interaction to produce a first image;

(b) whole frame imaging capture of said microarray under bright field illumination to obtain microsphere color signature/barcode image to produce a second image; and

(c) processing said first and second images to obtain identification of said identification of said nucleic acid sample.

22. The method of claim 21 wherein said processing uses a pattern recognition algorithm to obtain said identification.

23. The method of claim 21 wherein said microarray population of micro-spheres includes a plurality of sub-populations of micro-spheres, wherein each said sub-population of micro-spheres contains a unique optical barcode and has a unique probe nucleic acid sequence.

24. The method of claim 21 wherein said optical barcode is generated by two or more colorants.

25. The method of claim 21 wherein said optical barcode is generated by a mixture of red (R), green (G), and blue (B) colorants.